3.11 ENERGY

INTRODUCTION

This section describes existing energy consumption and trends within the SCAG region, identifies the potential impacts of the RTP on energy consumption, includes mitigation measures for the impacts, and evaluates the residual impacts.

ENVIRONMENTAL SETTING

Energy Types, Sources and Providers

Petroleum products supply approximately 39 percent of the energy demand in the U.S.[1] Natural gas supplies about 24 percent and coal about 23 percent of the national energy demand, nuclear about 8 percent and renewable sources about 6 percent. Current annual energy consumption in the U.S. is approximately 97 quadrillion British thermal units (Btu)[2], which represents approximately one-quarter of the world's energy consumption.[3]

Petroleum and natural gas supply most of the energy consumed in California. In 2001, petroleum products provided approximately 42 percent of the state's energy demand, and natural gas provided approximately 27 percent.[4] The remaining 31 percent of the state's energy demand was met by a variety of energy resources, including coal, nuclear, geothermal, wind, solar, and hydropower. Current annual energy consumption in California (for all purposes, including transportation) is approximately 8.4×10^{15} Btu, which represents approximately 4 percent of the nation's total energy consumption. California consumes more energy than any other state in the

1 United States Department of Energy, Energy Information Administration. (2002, October 26). *Annual energy review 2001 – Energy flow*. Retrieved July 31, 2003, from http://www.eia.doe.gov/emeu/aer/diagrams/diagram1.html.

2 The units of energy used in this report are British Thermal Units (Btu), kilowatt-hours (kWh), therms, and gallons. A Btu is the quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit at sea level. Since the other units of energy can all be converted into equivalent Btu units, the Btu is used as the basis for comparing energy consumption associated with different resources. A kWh is a unit of electrical energy, and one kWh is equivalent to approximately 10,200 Btu, taking into account initial conversion losses (i.e., from one type of energy, e.g., chemical, to another type of energy, e.g., mechanical) and transmission losses. Natural gas consumption typically is described in terms of cubic feet or therms; one cubic foot of natural gas is equivalent to approximately 1,050 Btu, and one therm represents 100,000 Btu. One gallon of gasoline/diesel is equivalent to approximately 140,000 Btu, taking into account energy consumed in the refining process.

3 United States Department of Energy, Energy Information Administration. (2003, May 1). *International energy outlook 2003*. Retrieved July 31, 2003, from http://www.eia.doe.gov/oiaf/ieo/tbl_1.html.

4 California Energy Commission (personal communication, March 25, 2003).

U.S., except for Texas.[5] However, in terms of energy consumption per person, California ranks 48th among the 50 states.

Petroleum

Most gasoline and diesel fuel sold in California for on-road motor vehicles is refined in California to meet state-specific formulations required by the Cal/EPA's Air Resources Board. Major petroleum refineries in California are concentrated in three counties: Contra Costa County in northern California, Kern County in central California, and Los Angeles County in southern California. In Los Angeles County, petroleum refineries are located mostly in the southern portion of the county.

In 2001, refineries in California processed approximately 655 million barrels of crude oil.[6] Almost half of the crude oil came from in-state oil production facilities; 21% came from Alaska; and the remaining (approximately 29 percent) came from foreign sources. The long-term oil supply outlook for California remains one of declining in-state and Alaska supplies leading to increasing dependence on foreign oil sources.

In the last fifty years, the human population has doubled, and the number of cars has grown tenfold from 50 to 500 million. As Americans continue to consume oil, oil demand could eventually outstrip oil supplies. By 2010, the world may be consuming as much as 90 million barrels per day, 20% more than it does now. The analyses of geophysicist M. King Hubbert suggest that one new barrel of oil is being found for every four barrels being consumed.[7] Hubbert predicted that sometime between 2005 and 2025, world oil production would reach a peak and begin a sharp decline. However, a government summary of several world oil price forecasts for 2025 does not indicate a steep increase in petroleum prices.[8]

Natural Gas

Eighty-five percent of the natural gas consumed in California comes from the Southwestern U.S., the Rocky Mountains, and Canada.[9] The remainder is produced in California. In the SCAG

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5 United States Department of Energy, Energy Information Administration. (n.d.). *Table 1.6: State-level energy consumption, expenditures, and prices, 1999*. Retrieved July 31, 2003, from http://www.eia.doe.gov/emeu/aer/txt/ptb0106.html.

6 California Energy Commission. (2003, May 5). *Oil and petroleum in California*. Retrieved July 31, 2003, from http://www.energy.ca.gov/oil/index.html.

7 Udall, R. and Andrews, S. (1999, January). When will the joy ride end? A petroleum primer. *Hubbert Center Newsletter, 99(1)*, 1-8.

8 United States Department of Energy, Energy Information Administration. (n.d.). Table 15: Comparison of World Oil Price Projections, 2005-2025. Retrieved December 8, 2003, from http://www.eia.doe.gov/oiaf/ieo/tbl_15.html

9 California Energy Commission. (2003, July 23). *California's major sources of energy*. Retrieved July 31, 2003, from http://www.energy.ca.gov/html/energysources.html.

region, more than a third of the natural gas consumed in 2000 was used to generate electricity. Residential consumption represented about 22% of natural gas use with the balance consumed by the industrial, resource extraction, and commercial sectors.[10]

Southern California Gas Company, a privately owned utility company, provides natural gas service throughout the SCAG region, except for the City of Long Beach, the southern portion of Orange County, and portions of San Bernardino County. The service area for Long Beach Energy, a municipal utility and natural gas supplier owned and operated by the City of Long Beach, includes the cities of Long Beach and Signal Hill, and sections of surrounding communities, including Lakewood, Bellflower, Compton, Seal Beach, Paramount, and Los Alamitos. San Diego Gas & Electric Company provides natural gas service to the southern portion of Orange County. In San Bernardino County, Southwest Gas Corporation provides natural gas service to Victorville, Big Bear, Barstow, and Needles.

Electricity

Assembly Bill 1890, which was signed into law in 1996, attempted to restructure California's electricity market. Flaws in the market design combined with natural gas supply shortages and a number of other factors to produce an energy crisis in the state that resulted in numerous rolling blackouts, huge electricity price spikes, and bankruptcy or near-bankruptcy for two of the state's private utilities. The legislature responded by rescinding much of the deregulation scheme, creating a new state power authority, and enacting emergency energy conservation measures, mostly in the form of rebates and incentives. Currently, it is not clear whether lawmakers will choose to try again with a restructured market, or return to the former regulated market. This uncertainty has deterred many private investors from pursuing energy projects, meaning that the state's, and the region's, future energy supply is far from assured.

Power plants in California meet approximately 85 percent of the in-state electricity demand. Hydroelectric power from the Pacific Northwest provides another 2.6 percent, down due to drought conditions in recent years, and power plants in the southwestern U.S. provide another 13 percent.[11] The relative contribution of in-state and out-of-state power plants depends upon, among other factors, the precipitation that occurred in the previous year and the corresponding amount of hydroelectric power that is available. Two of the largest power plants in California are located in the SCAG region: Alamitos and Redondo Beach. Both of these plants consume natural gas. San Onofre, the state's largest power plant in terms of net capability, is nuclear powered and is located just south of the SCAG region in San Diego County.

Local electricity distribution service is provided to customers within the SCAG region by one of two privately owned utilities – either Southern California Edison Company or San Diego-based

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10 California Gas Utilities. (n.d.). *2000 California gas report*. Retrieved July 31, 2003, from Southern California Gas Company Web site: http://www.socalgas.com/regulatory/docs/2000report.pdf.

11 California Energy Commission. (2003, July 23). *California's major sources of energy*. Retrieved July 31, 2003, from http://www.energy.ca.gov/html/energysources.html

Sempra Energy – or by a publicly-owned utility, such as the Los Angeles Department of Water and Power and the Imperial Irrigation District. Southern California Edison is the largest electricity utility in southern California with a service area that covers all or nearly all of Orange, San Bernardino, and Ventura Counties, and most of Los Angeles and Riverside Counties. Southern California Edison Company provides approximately 70 percent of the total electricity demand in the SCAG region. Sempra Energy provides local distribution service to the southern portion of Orange County.

The Los Angeles Department of Water and Power is the largest of the publicly owned electric utilities in southern California. Los Angeles Department of Water and Power provides electricity service to most customers located in the City of Los Angeles and provides approximately 20 percent of the total electricity demand in the SCAG region. Other cities that operate their own electric utilities in the SCAG region include Burbank, Glendale, Pasadena, Azusa, Vernon, Anaheim, Riverside, Banning, and Colton. Two water districts provide local electric service within the SCAG region: Imperial Irrigation District and Southern California Water Company. Imperial Irrigation District provides electricity to customers in Imperial County and the Coachella Valley portion of Riverside County. Southern California Water Company provides electric service to the community of Big Bear. Anza Electric Cooperative provides local distribution service to the Anza Valley area of southern Riverside County.

Consumptive Uses

Consumptive uses of energy in the SCAG region are summarized in Table 3.11-1 for the years indicated. These data are the most recent available in each case and are therefore the most representative of current conditions.

Transportation

Transportation, i.e., the movement of people and goods from place to place, is an important end use of energy in California, accounting for approximately 40 percent of total statewide energy consumption in 2001.[12] Nonrenewable energy products derived from crude oil, including gasoline, diesel, kerosene, and residual fuel, provide most of the energy consumed for transportation purposes by on-road motor vehicles (i.e., automobiles and trucks), locomotives, aircraft, and ships. In addition, energy is consumed in connection with construction and maintenance of transportation infrastructure, such as highways, locomotives, runways, and berths. Trends in transportation-related technology foretell increased use of electricity and natural gas for transportation purposes.

Transportation energy is derived from a wide variety of petroleum products. Automobiles and trucks consume gasoline and diesel fuel. Turbine aircraft consume kerosene fuel; locomotives consume diesel fuel; and ships consume residual fuel oil. The transportation sector consumes relatively minor amounts of natural gas or electricity, but, propelled mainly by air quality laws and

[12] California Energy Commission (personal communication March 25, 2003).

Table 3.11-1: Annual Transportation Energy Consumption in the SCAG Region for Base Years as Indicated

Category	Fuel Type	Year	Consumption	Units
Motor Vehicles	Gasoline/Diesel	1997	6,091,080	thousand gallons
	Natural Gas	2000	33	million therms
Aircraft	Kerosene (Jet A)	2001	1,266,806	thousand gallons
Locomotives	Diesel	2000	177,611	thousand gallons
Ships	Residual Fuel	2000	386,631	thousand gallons
on Btu basis:				
Motor Vehicles	Gasoline/Diesel	1997	852,751,179	million Btu
	Natural Gas	2000	3,300,000	million Btu
Aircraft	Kerosene (Jet A)	2001	171,018,856	million Btu
Locomotives	Diesel	2000	24,865,594	million Btu
Ships	Residual Fuel	2000	57,994,646	million Btu

NOTE: As of the base year, electricity does not supply a significant portion of transportation energy needs in the SCAG region.

Sources: California Energy Commission. (2000, June). *California energy demand 2000-2010*. Sacramento, CA: Author.

Port of Los Angeles. (2001). *2000 statistics*. Retrieved July 31, 2003, from http://www.portoflosangeles.org/statistics/detailstat_year=2000.htm

Port of Long Beach. (n.d.). *5 year cargo statistics*. Retrieved July 31, 2003, from http://www.polb.com/html/2_portStats/comparison.html

Southern California Association of Governments. (2001). *2001 regional transportation plan update*. Los Angeles: Author.

Southern California Association of Governments. (n.d.). *A century of growth: Regional population 1900-2000*. Retrieved August 11, 2003, from http://www.scag.ca.gov/census/pdf/regionweb.pdf

A. Thompson (personal communication, April 11, 2003)

United States Army Corps of Engineers. (2002, February 28). *Civil works program statistics* (Information Paper CECW-ZD). Washington, DC: Author.

United States Bureau of the Census.

United States Department of Transportation, Bureau of Transportation Statistics. (2003, August 11). *Air carrier summary data (Form 41 and 298C summary data)*. Retrieved August 11, 2003, from http://www.transtats.bts.gov/Tables.asp?DB_ID=130&DB_Name=Air%20Carrier%20Summary%20Data%20%28Form%2041%20and%20298C%20Summary%20Data%29&DB_Short_Name=Air%20Carrier%20Summary

United States Department of Energy, Energy Information Administration. (n.d.). *Table 13: Adjusted sales of distillate fuel oil by energy use in the United States: 1997-2001*. Retrieved August 11, 2003, from http://www.eia.doe.gov/pub/oil_gas/petroleum/data_publications/fuel_oil_and_kerosene_sales/current/pdf/table13.pdf

United States Department of Energy, Energy Information Administration. (n.d.). *Table 14: Adjusted sales of residual fuel oil by energy use in the United States: 1997 - 2001*. Retrieved August 11, 2003, from http://www.eia.doe.gov/pub/oil_gas/petroleum/data_publications/fuel_oil_and_kerosene_sales/current/pdf/table14.pdf

regulations, technological innovations in transportation are expected to increasingly rely on compressed natural gas and electricity as energy sources. Biodiesel, derived from plant sources such as used vegetable oils, is a small but growing source of transportation fuel. Vehicles powered by fuels other than gasoline or diesel are referred to as "alternative fuel vehicles."

Roadways

Energy consumption by on-road motor vehicles reflects the types and numbers of vehicles, the extent of their use (typically described in terms of VMT), and their fuel economy (typically described in terms of miles per gallon). Trends in energy consumption by on-road motor vehicles generally follow trends in population and per capita income as well as trends in land use development patterns. For example, diffuse land use development patterns can result in an imbalance between jobs and housing, which can lead to longer average commute trips.

Airports

As shown in Table 3.11-1, kerosene (Jet A) consumption in the SCAG region for transportation purposes represents approximately 15 percent of total transportation energy consumption. The SCAG region includes 64 airports including 8 commercial or primary airports, 9 metropolitan airports, 19 regional airports, 10 community airports, 8 limited use airports, two joint-use military and commercial airports, and 8 airports operated by the military or by the National Aeronautics and Space Administration.[13] The 8 commercial or primary airports in the SCAG region include Los Angeles International Airport, Bob Hope Airport, and Long Beach Airport in Los Angeles County; John Wayne Airport in Orange County; Ontario International Airport in San Bernardino County; Palm Springs International Airport in Riverside County; Oxnard Airport in Ventura County, and Imperial County Airport in Imperial County.

In 2001, passenger activity at these airports was approximately 82 million passengers, which is approximately 6 percent of the nation's total air passenger traffic. The SCAG region's consumption of aviation kerosene was estimated by applying this ratio to total U.S. commercial aviation fuel consumption as reported by the Federal Aviation Administration.[14]

Ports

Table 3.11-1 also includes energy consumption estimates for locomotives and ships. Locomotive consumption of diesel fuel in the SCAG region was estimated by applying the ratio of the population in the region over the total U.S. population to nation-wide estimates of diesel fuel consumption by railroad operations. Residual fuel (Bunker "C") consumption by ships in the SCAG region was estimated by applying the ratio of waterborne traffic (in millions of short tons)

[13] California Department of Transportation. (1998). *The California aviation system plan, 1998*. Sacramento, CA: Author.

[14] United States Department of Transportation, Federal Aviation Administration. (n.d.). *Table 22: Total jet fuel and aviation gasoline fuel consumption, U.S. civil aviation aircraft*. Retrieved August 11, 2003, from http://apo.faa.gov/foreca00/actab22.pdf.

associated with Long Beach and Los Angeles Ports[15] over total national waterborne traffic[16] to nation-wide estimates of residual fuel consumption for vessel bunkering. Together, locomotives and ships represent approximately 7 percent of the transportation energy consumption in the SCAG region.

Residential, Commercial, Industrial, and Other Uses

Major energy consumption sectors (in addition to transportation) include residential, commercial, industrial uses as well as street lighting, mining, and agriculture. Unlike transportation, these sectors primarily consume electricity and natural gas. Total annual electricity consumption in the SCAG region is approximately 123,500 million kilowatt hours (kWh),[17] which is equivalent to approximately 1,259,700 billion Btu, taking into account conversion and transmission losses. The residential, commercial, and industrial sectors account for approximately 29, 46, and 21 percent, respectively, of total regional electricity consumption. The agricultural sector accounts for another 4 percent. Within the residential sector, lighting, small appliances, and refrigeration account for most (approximately 60 percent) of the electricity consumption, and within the industrial and commercial sector, lighting, motors, and air cooling account for most (approximately 65 percent) of the electricity consumption.

Electricity use by households varies depending on the local climate and on the housing type (i.e., single-family vs. multi-family). Table 3.11-2 summarizes average monthly per-household electricity use for both housing types for four distinct geographic zones in the SCAG region: the cooler and more temperate coastal zone, an inland valley zone and desert zone where temperatures are more extreme, and the state's Central Valley (few SCAG households fall into this zone).

Table 3.11-2: Average Monthly Household Electricity Usage

Planning Area	Single Family (kWh/month)	Multi-Family (kWh/month)
Central Valley	645	410
Coastal	532	309
Inland Valley	557	323
Desert	637	373

Source: Southern California Edison, personal communication, August 29, 2003.

15 Port of Long Beach. (n.d.). *Monthly tonnage summary*. Retrieved July 31, 2003, from http://polb.com/html/2_portStats/tonnage.html and Port of Los Angeles. (2001). *2000 statistics*. Retrieved July 31, 2003, from http://www.portoflosangeles.org/statistics/detailstat_year=2000.htm.

16 United States Army Corps of Engineers. (2002, February 28). *Civil works program statistics* (Information Paper CECW-ZD). Washington, DC: Author.

17 California Energy Commission. (2001, September). California energy demand forecast. Sacramento, CA: Author.

Total annual natural gas (end use) consumption in the SCAG region is approximately 6,555 million therms,[18] which is equivalent to approximately 6,555,000 billion Btu. The residential, commercial, and industrial sectors account for approximately 38, 14, and 49 percent, respectively, of total regional natural gas (end use) consumption. Space and water heating account for approximately 61 percent of residential natural gas consumption and approximately 42 percent of commercial natural gas consumption.

Consumption Reduction Efforts

Most of the utilities that provide electric and natural gas service also administer energy conservation programs. These programs typically include home energy audits; incentives for replacement of existing appliances with new, energy-efficient models; provision of resources to inform businesses on development and operation of energy-efficient buildings; and construction of infrastructure to accommodate increased use of motor vehicles powered by natural gas or electricity.

REGULATORY SETTING

Federal and state agencies regulate energy use and consumption through various means and programs. On the federal level, the USDOT, U.S. Department of Energy, and USEPA are three agencies with substantial influence over energy policies and programs. Generally, federal agencies influence transportation energy consumption through establishment and enforcement of fuel economy standards for automobiles and light trucks, through funding of energy-related research and development projects, and through funding for transportation infrastructure projects.

On the state level, the California Public Utilities Commission, California Energy Commission, and California Power Authority are the main agencies with authority over different aspects of energy. The California Public Utilities Commission regulates privately owned utilities in the energy, rail, telecommunications, and water fields. The California Energy Commission collects and analyzes energy-related data, prepares statewide energy policy recommendations and plans, promotes and funds energy efficiency programs, and regulates the power plant siting process. The California Power Authority, established after statewide electricity and natural gas shortages and price shocks in 2000 and 2001, is responsible for ensuring a sufficient surplus of electricity in the state. California is preempted under federal law from setting state fuel economy standards for new on-road motor vehicles. Some of the more relevant federal and state transportation-energy-related laws and plans are discussed below.

Federal Regulations

Energy Policy and Conservation Act

The Energy Policy and Conservation Act of 1975 sought to ensure that all vehicles sold in the U.S. would meet certain fuel economy goals. Through this Act, Congress established the first

[18] California Energy Commission. (n.d.). *Quarterly fuel and energy report*. Sacramento, CA: Author.

fuel economy standards for on-road motor vehicles in the U.S. Pursuant to the Act, the National Highway Traffic and Safety Administration, which is part of the USDOT, is responsible for establishing additional vehicle standards and for revising existing standards. Since 1990, the fuel economy standard for new passenger cars has been 27.5 miles per gallon. Since 1996, the fuel economy standard for new light trucks (gross vehicle weight of 8,500 pounds or less) has been 20.7 miles per gallon. Heavy-duty vehicles (i.e., vehicles and trucks over 8,500 pounds gross vehicle weight) are not currently subject to fuel economy standards.

Compliance with federal fuel economy standards is determined on the basis of each manufacturer's average fuel economy for the portion of their vehicles produced for sale in the U.S. The Corporate Average Fuel Economy (CAFE) program, which is administered by USEPA, was created to determine vehicle manufacturers' compliance with the fuel economy standards. USEPA calculates a CAFE value for each manufacturer based on city and highway fuel economy test results and vehicle sales. Based on the information generated under the CAFE program, the USDOT is authorized to assess penalties for noncompliance.

Intermodal Surface Transportation Efficiency Act

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) promoted the development of intermodal transportation systems to maximize mobility as well as address national and local interests in air quality and energy. ISTEA contained factors that MPOs, such as SCAG, were to address in developing transportation plans and programs, including some energy-related factors. To meet the ISTEA requirements, MPOs adopted explicit policies defining the social, economic, energy, and environmental values that were to guide transportation decisions in that metropolitan area. The planning process was then to address these policies. Another requirement was to consider the consistency of transportation planning with federal, state, and local energy goals. Through this requirement, energy consumption was expected to become a decision criterion, along with cost and other values that determine the best transportation solution.

Clean Cities Program

The U.S. Department of Energy's Clean Cities Program promotes voluntary, locally based government/industry partnerships for the purpose of expanding the use of alternatives to gasoline and diesel fuel by accelerating the deployment of alternative fuel vehicles (AFVs) and building a local AFV refueling infrastructure.[19] The Clean Cities Program has created more than 70 partnerships in communities throughout the country. Six of these partnerships have been established in the SCAG region: Antelope Valley, Coachella Valley, Long Beach, Los Angeles, Northwest Riverside, and one administered by SCAG.

[19] United States Department of Energy. (1999, January). *Clean cities game plan 1999: Strategic plan for the clean cities program*. Washington, DC: Author.

State Regulations and Policies

State of California Integrated Energy Policy Report

In 2002, the Legislature reconstituted the State's responsibility to develop an integrated energy plan for electricity, natural gas, and transportation fuels. On November 1, 2003, and every two years thereafter, the California Energy Commission, in consultation with other State energy agencies, must provide an overview of the major energy trends and issues facing California, including supply, demand, price, reliability, and efficiency. It must assess the impacts of these trends and issues on public health and safety, the economy, resources, and the environment. Finally, it must make policy recommendations to the Governor and the Legislature that are based on an in-depth and integrated analysis of the most current and pressing energy issues facing the State.[20]

Reducing California's Petroleum Dependence

The California Energy Commission and the California Air Resources Board produced a joint report *Reducing California's Petroleum Dependence* to highlight petroleum consumption and to establish a performance based goal to reduce petroleum consumption in California over the next thirty years. The report includes the following recommendations to the Governor and Legislature regarding petroleum:[21]

- Adopt the recommended statewide goal of reducing demand for on-road gasoline and diesel to 15 percent below the 2003 demand level by 2020 and maintaining that level for the foreseeable future.
- Work with the California delegation and other states to establish national fuel economy standards that double the fuel efficiency of new cars, light trucks, and sport utility vehicles.
- Establish a goal to increase the use of non-petroleum fuels to 20 percent of on-road fuel consumption by 2020 and 30 percent by 2030.

The California Energy Commission will use these recommendations when developing its series of recommendations to the Governor and Legislature for the integrated energy plan for electricity, natural gas, and transportation fuels.

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20 California Energy Commission (personal communication March 25, 2003).

21 California Energy Commission and California Air Resources Board. (2003, August). *Reducing California's petroleum dependence* (Publication P600-03-005F). Retrieved August 26, 2003, from http://www.energy.ca.gov/reports/2003-08-14_600-03-005.PDF.

Renewables Portfolio Standard

California's renewables portfolio standard (RPS) requires retail sellers of electricity to increase their procurement of eligible renewable energy resources by at least 1 percent per year so that 20 percent of their retail sales are procured from eligible renewable energy resources by 2017.[22] If a seller falls short in a given year, they must procure more renewables in succeeding years to make up the shortfall. Once a retail seller reaches 20%, they need not increase their procurement in succeeding years. The Standard was enacted via SB 1078 (Sher), signed September 2002 by Governor Davis. The California Energy Commission and the California Public Utilities Commission are jointly implementing the standard.

METHODOLOGY

This section summarizes the methodology used to evaluate the expected impacts of implementation of the proposed Plan on energy consumption and associated environmental effects. Estimated energy consumption in 2030 is expected to represent the most conservative (i.e., highest) energy consumption because population and employment are projected to be higher in this year than in any earlier year. Also, no estimate is made of the impact of energy efficiency and conservation measures which are likely to be adopted, resulting in energy consumption lower than that projected in this chapter.

Expected direct, transportation energy consumption was estimated for 2030 using SCAG's regional transportation demand model and the EMFAC/BURDEN air quality model, which provides estimated gasoline and diesel fuel consumption for the 2004 RTP and Alternatives. Energy consumption for the other elements of the transportation plan (Maglev, transit, etc.) was also estimated and evaluated.

Expected future residential energy consumption was estimated using average monthly energy consumption figures, provided by Southern California Edison, for single- and multi-family dwelling units in four different climate zones: Central Valley, Coastal, Inland Valley, and Desert (see Table 3.11-2). These figures were multiplied by SCAG's projected single- and multi-family household counts to provide a comparison of total residential energy consumption for the various Alternatives.[23]

Comparison with the No Project

The analysis of energy resources includes a comparison between the expected future conditions with the proposed Plan and the expected future conditions if no Plan were adopted. This

22 Under the bill, publicly-owned utilities must have a renewables portfolio standard but are not subject to the percentage requirements and time limits.

23 Average monthly consumption reflecting current usage was used with household estimates for 2030, since no projected future average monthly consumption rate was available from Edison.

evaluation is not included in the determination of the significance of impacts; however, it provides a meaningful perspective on the expected effects of the 2004 RTP.

Determination of Significance

The methodology for determining the significance of energy impacts compares existing conditions to the expected future energy consumption with the Plan, as required in CEQA Guidelines Section 15126.2(a). Criteria below were applied to compare current energy usage to expected future (2030) Plan conditions.

SIGNIFICANCE CRITERIA

A *significant impact* is defined as "a substantial or potentially substantial, adverse change in the environment" (Public Resources Code §21068). The proposed Plan would have a significant impact if implementation would potentially:

- Substantially increase the consumption of electricity, natural gas, gasoline, diesel, or other non-renewable energy types between the current conditions and 2030;
- Use substantial amounts of electricity and natural gas, thereby requiring the construction of new facilities and sources of energy or major improvements to local infrastructure;
- Cause a cumulatively considerable increase in energy consumption and associated environmental effects; or
- Cause the use of large amounts of electricity and natural gas in a wasteful manner.

IMPACTS AND MITIGATION MEASURES

Implementation of the 2004 RTP would affect the use of energy resources in the SCAG region. The analysis of these impacts is at the regional level and is therefore by its nature an analysis of cumulative impacts. Three main areas of impact have been identified: energy demands for construction and expansion of the regional transportation system; energy demands for operation of the regional transportation system as of 2030; and the cumulative impacts of growing energy demand associated with implementation of the 2004 RTP.

All mitigation measures shall be included in project-level analysis as appropriate. The lead agency for each individual project in the Plan shall be responsible for ensuring adherence to the mitigation measures prior to construction. SCAG shall be provided with documentation of compliance with mitigation measures through SCAG's monitoring efforts, including SCAG's Intergovernmental Review Process.

Impact 3.11-1: The implementation of the 2004 RTP is likely to use electricity, natural gas, gasoline, diesel, or other non-renewable energy types in the construction and expansion of the regional transportation system. This would be a less-than-significant impact.

Construction of the new elements of the regional transportation system included in the 2004 RTP will likely involve the use of diesel-powered heavy equipment, portable diesel generators, and other battery-operated support equipment, as well as electricity from the existing grid. There would be an irreversible impact from the consumption of diesel fuel (and other fuels) related to these construction activities. However, the 2004 RTP does not contemplate an increase in the amount of regional transportation system construction beyond current, ongoing levels of transportation system construction. Thus, it is unlikely that the energy demands of construction of the new elements of the regional transportation system would create a noticeable impact to regional energy systems. Therefore, this construction impact would be less than significant.

Mitigation Measures

None.

Significance After Mitigation

The impact is **less than significant.**

Impact 3.11-2: The implementation of the 2004 RTP is likely to substantially increase the consumption of electricity, natural gas, gasoline, diesel, or other non-renewable energy types in the operation of the transportation system between the current conditions and 2030. This would be a significant impact.

Operation of the transportation system as described in the 2004 RTP would involve a substantial increase in the use of petroleum fuels between the current conditions and 2030. Table 3.11-3 summarizes the expected increases in fuel usage, as predicted by SCAG's transportation and air quality model, between 2000 and 2030 with the investments in the RTP and without (the No Project Alternative).

Table 3.11-3. Projected SCAG Region Transportation Fuel Consumption (thousand gallons per day)

Alternative	Gasoline	Percent Increase over Base Year 2000	Diesel	Percent Increase over Base Year 2000	Total	Percent Increase over Base Year 2000
Base Year 2000	19,285.06	--	3,404.59	--	22,689.65	--
2030 No Project	25,038.86	32%	6,397.25	92%	31,436.11	41%
2030 with 2004 RTP	23,354.77	23%	6,574.61	97%	29,929.38	34%

Source: SCAG EMFAC/BURDEN Analysis, 2003

If world fuel supplies drop and prices increase dramatically, the cost of owning and maintaining a conventional vehicle could also increase. To help reduce the possible effects of this situation,

greater use of alternative fuels, public transit, and non-motorized transportation options must be encouraged. The mitigation measures listed below would help to further reduce petroleum and diesel demand in the SCAG region.

In addition to increased use of petroleum fuels, projects in the 2004 RTP would be expected to consume natural gas and electricity. Street lighting for new highways and arterials and nighttime lighting for rail projects would consume electricity. New transit vehicles and transit stations for Maglev, Metrolink, light rail and rapid bus would require electricity and natural gas during project operation. In response to air quality concerns, it is likely that in the future more buses would use natural gas instead of petroleum-based fuels for daily operations. The implementation of mitigation measures identified below would reduce the significance of these impacts.

Maglev would also use electricity for operation. Maglev trains are powered by electricity and elevated electromagnetically along a track. According to the Maglev environmental assessment performed in March 2000, power requirements would vary depending on the number of operating trains, their time of operation, their operating speed, number of passengers per train, and several other factors.[24] For a single train, energy consumption is anticipated to be approximately 2,412 million Btu on a single day with an annual consumption of 745,300 million Btu. The Maglev stations are assumed to consume approximately 10% of what a single train would consume. Therefore, one train and one station are anticipated to consume approximately 2,653 million Btu in a day and 819,832 million Btu annually.[25]

Mitigation Measures

In addition to the mitigation measures specified below, mitigation measures for the impacts of transportation system usage would serve to mitigate the impacts of growing transportation energy demand. In particular, Mitigation Measures **MM 3.3-1a, MM 3.4-1a and MM 3.4-1b** would contribute to energy impact mitigation.

MM 3.11-2a: Project implementation agencies shall review energy impacts as part of project-specific environmental review as required by CEQA. For any identified impacts, appropriate mitigation measures should be identified. The project implementation agency or local jurisdiction shall be responsible for ensuring adherence to the mitigation measures.

MM 3.11-2b: For any project anticipated to require substantial electrical usage, the project implementation agency shall submit projected electricity and natural gas demand calculations to the local electricity or natural gas provider, respectively, for its analysis. Any infrastructure improvements necessary for project construction shall be completed according to the specifications of the energy provider.

24 Parsons, (2000, March 1), *Environmental Assessment for Maglev*.

25 *Ibid.*

MM 3.11-2c: Transit providers shall, as feasible, assure that designers of new transit stations incorporate solar panels in roofing and tap other renewable energy sources to offset new demand on conventional power sources.

MM 3.11-2d: SCAG shall encourage state and federal lawmakers and regulatory agencies to pursue the design of programs to either require or incentivize the expanded availability and use of alternative-fuel vehicles to reduce the impact of shifts in petroleum fuel supply and price.

Significance After Mitigation

The regional increase in transportation-related energy demand as a result of implementing the 2004 RTP would remain a **significant** impact, even with the above mitigation.

Cumulative Impacts

A cumulative impact consists of an impact which is created as a result of the combination of the 2004 RTP together with other projects causing related impacts.

The 2030 transportation model includes the population, households, and employment projected for 2030, and therefore the largest demand on the transportation system expected during the lifetime of the 2004 RTP. In accounting for the effects of regional population growth, the model output provides a regional, long-term and cumulative level of analysis for the impacts of the 2004 RTP on transportation resources. **Forecast urban development and growth that would be accommodated by the transportation investments in the 2004 RTP, together with the increased mobility provided by the 2004 RTP, would contribute to the significant impacts described in Impact 3.11-2 above.**

In addition to the impacts described above, the urban development and growth that would be accommodated by the transportation investments in the 2004 RTP would have the following cumulative impact:

Cumulative Impact 3.11-3: Implementation of the investments and policies in the 2004 RTP would contribute to a cumulatively considerable increase in the amount of total energy consumed in the SCAG region between 2000 and 2030. This would be a significant impact.

Forecast urban development and growth that would be accommodated by the transportation investments in the 2004 RTP would entail substantially greater use of energy resources in 2030 than in 2000 for purposes indirectly related to transportation, such as housing and employment. For example, the estimated increase in residential energy consumption is projected to be comparable in magnitude to the overall increase in regional population. It is beyond the scope of this analysis to project how this increased energy demand will be met, but public and private energy providers should continue their current long-range planning processes to assure that there is no shortfall. A variety of energy sources are available, and recent state actions (see

Regulatory Setting) should help to meet the growth in energy demand while minimizing associated environmental impact and reducing dependence on fossil fuels. Mitigation Measures **MM 3.11-2a through MM 3.11-2d** will help to mitigate the cumulative impacts on energy consumption related to the 2004 RTP in addition to the following measure:

MM 3.11-3a: SCAG shall continue to work with local jurisdictions and energy providers, through its Energy and Environment Committee and other means, to encourage regional-scale planning for improved energy management. Future impacts to energy shall be minimized through cooperative planning, and information sharing within the SCAG region. This cooperative planning shall occur during the update of the Energy chapter of SCAG's *RCPG*.

Significance After Mitigation

Even with mitigation, this cumulative impact can be expected to remain **significant**.

Comparison with the No Project

In the No Project Alternative, the regional population is projected to be the same as the Plan Alternative, but no regional transportation investments would be made beyond the existing programmed projects. The population distribution is assumed to follow past trends, uninfluenced by additional transportation investments.

Direct Impacts

The No Project Alternative would result in the construction of only about 1,500 new lane miles, compared with over 6,700 new lane miles in the Plan Alternative. As shown in Table 3.11-3, the total projected use of transportation fuels would increase in the SCAG region even more in 2030 under the No Project conditions than under the Plan Alternative (an increase of 41% for the No Project vs. 34% for the Plan). This difference would result from the additional travel necessary without the Plan improvements to the regional transportation system. Thus, the No Project Alternative would have an even greater significant impact on regional transportation energy usage (Impact 3.11-2) than would the Plan Alternative. The No Project Alternative could be expected to have a smaller, though still less-than-significant, impact on energy needs for construction than the Plan Alternative since fewer new projects would be built.

Cumulative Impacts

Overall transportation energy usage is projected to be greater under the No Project Alternative than under the Plan Alternative. However, the analysis of residential growth distributions indicates that under the No Project, total residential energy usage would be slightly lower than under the Plan because there would be fewer total households under the No Project Alternative. In total, it is likely that given the region's projected growth, the increase in total regional energy usage under the No Project scenario would still be cumulatively considerable and therefore significant.

References

California Department of Transportation. (1998). *The California aviation system plan, 1998*. Sacramento, CA: Author.

California Energy Commission and California Air Resources Board. (2003, August). *Reducing California's petroleum dependence* (Publication P600-03-005F). Retrieved August 26, 2003, from http://www.energy.ca.gov/reports/2003-08-14_600-03-005.PDF.

California Energy Commission. (2000, June). *California energy demand 2000-2010*. Sacramento, CA: Author.

California Energy Commission. (2001, September). California energy demand forecast. Sacramento, CA: Author.

California Energy Commission. (2003, July 23). *California's major sources of energy*. Retrieved July 31, 2003, from http://www.energy.ca.gov/html/energysources.html.

California Energy Commission. (2003, May 5). *Oil and petroleum in California*. Retrieved July 31, 2003, from http://www.energy.ca.gov/oil/index.html.

California Energy Commission. (n.d.). *Quarterly fuel and energy report*. Sacramento, CA: Author.

California Gas Utilities. (n.d.). *2000 California gas report*. Retrieved July 31, 2003, from Southern California Gas Company Web site: http://www.socalgas.com/regulatory/docs/2000report.pdf.

Parsons, (2000, March 1), *Environmental Assessment for Maglev*.

Port of Long Beach. (n.d.). *5 year cargo statistics*. Retrieved July 31, 2003, from http://www.polb.com/html/2_portStats/comparison.html.

Port of Long Beach. (n.d.). *Monthly tonnage summary*. Retrieved July 31, 2003, from http://polb.com/html/2_portStats/tonnage.html.

Port of Los Angeles. (2001). *2000 statistics*. Retrieved July 31, 2003, from http://www.portoflosangeles.org/statistics/detailstat_year=2000.htm.

Southern California Association of Governments. (2001). *2001 regional transportation plan update*. Los Angeles: Author.

Southern California Association of Governments. (n.d.). *A century of growth: Regional population 1900-2000*. Retrieved August 11, 2003, from http://www.scag.ca.gov/census/pdf/regionweb.pdf.

Udall, R. and Andrews, S. (1999, January). When will the joy ride end? A petroleum primer. *Hubbert Center Newsletter, 99(1)*, 1-8.

United States Army Corps of Engineers. (2002, February 28). *Civil works program statistics* (Information Paper CECW-ZD). Washington, DC: Author.

United States Bureau of the Census.

United States Department of Energy, Energy Information Administration. (n.d.). *Table 13: Adjusted sales of distillate fuel oil by energy use in the United States: 1997-2001*. Retrieved August 11, 2003, from http://www.eia.doe.gov/pub/oil_gas/petroleum/data_publications/fuel_oil_and_kerosene_sales/current/pdf/table13.pdf.

United States Department of Energy, Energy Information Administration. (n.d.). *Table 14: Adjusted sales of residual fuel oil by energy use in the United States: 1997 - 2001*. Retrieved August 11, 2003, from http://www.eia.doe.gov/pub/oil_gas/petroleum/data_publications/fuel_oil_and_kerosene_sales/current/pdf/table14.pdf.

United States Department of Energy, Energy Information Administration. (2002, October 26). *Annual energy review 2001 – Energy flow*. Retrieved July 31, 2003, from http://www.eia.doe.gov/emeu/aer/diagrams/diagram1.html.

United States Department of Energy, Energy Information Administration. (2003, May 1). *International energy outlook 2003*. Retrieved July 31, 2003, from http://www.eia.doe.gov/oiaf/ieo/tbl_1.html.

United States Department of Energy, Energy Information Administration. (n.d.). *Table 1.6: State-level energy consumption, expenditures, and prices, 1999*. Retrieved July 31, 2003, from http://www.eia.doe.gov/emeu/aer/txt/ptb0106.html.

United States Department of Energy, Energy Information Administration. (n.d.). Table 15: Comparison of World Oil Price Projections, 2005-2025. Retrieved December 8, 2003, from http://www.eia.doe.gov/oiaf/ieo/tbl_15.html

United States Department of Energy. (1999, January). *Clean cities game plan 1999: Strategic plan for the clean cities program*. Washington, DC: Author.

United States Department of Transportation, Bureau of Transportation Statistics. (2003, August 11). *Air carrier summary data (Form 41 and 298C summary data)*. Retrieved August 11, 2003, from http://www.transtats.bts.gov/Tables.asp?DB_ID=130&DB_Name=Air%20Carrier%20Summary%20Data%20%28Form%2041%20and%20298C%20Summary%20Data%29&DB_Short_Name=Air%20Carrier%20Summary.

United States Department of Transportation, Federal Aviation Administration. (n.d.). *Table 22: Total Jet Fuel and Aviation Gasoline Fuel Consumption, U.S. Civil Aviation Aircraft*. Retrieved August 11, 2003, from http://apo.faa.gov/foreca00/actab22.pdf.